to the cardinal teeth of "*abruptus*", Call himself (ibid. page 492) writes that they are "nearly smooth", in which he is correct. Those of the "*retusa*", the reader may prove by inspection of several, are in fact, remarkably "sulcated".

"Nacre flesh color, and very iridescent with purple and violet". Such coloring in the *abruptus* has never been seen by the writer, but applies very well to some specimens of the *retusa*. The nacre of the latter is generally said to be "deep purple", but it is sometimes white, and sometimes with a blush of pink; especially when young.

An attentive reading of Hildreth's description will show that his shell was correctly placed by the earlier naturalists—for it must be remembered that the several species called *subrotunda*, *torsus* etc., might have been lumped together by them. Say at any rate never mentioned the *torsus* or *retusa* in any of his writings.

Whether Hildreth's species be the *subrotunda* or the *retusa* is merely of academic interest; the facts which interest us being that it is absolutely *not* Say's species, *Unio abruptus;* and the latter name, after resting in the synonymy for almost a hundred years, must be used as the valid name of what has been incorrectly called *Unio orbiculatus* Hildreth.

GAYLE, LOUISIANA.

NOTES ON THE ANATOMY AND TAXONOMY OF CERTAIN LAMPSILINAE FROM THE GULF DRAINAGE

BY A. E. ORTMANN, PH. D.

(*Continued from page 105*)

8. MICROMYA VANUXEMENSIS UMBRANS (Lea) (1857).

See: *Lampsilis propria* and *umbrans=vanuxemensis*, Simpson, 1914, p. 105 and 103.

E. vanuxemensis, of the Cumberland-Tennessee-system, has also been reported from the upper Coosa drainage. The following accepted synonyms are from this region.

U. umbrans (=*umbrosus*), Lea, 1857. A typical female in shape, with dark brown epidermis and dark purple nacre.—Othcalooga Creek, Gordon Co., Ga.

U. tenebricus Lea, 1857. The figure represents a male, with dark brown epidermis and purple or salmon nacre.—Etowah River, Ga.

U. fabaceus Lea, 1861. A male, not full grown. Epidermis dark brown, nacre purplish and salmon near the margin.—Oostanaula River, Ga.

Another, very closely allied form, has been reported from this region: *U. proprius* Lea (1865). Simpson (p. 104) suspects that it may be only a smaller and paler form of *vanuxemensis*. It originally comes from Lafayette, Walker Co., Ga. (headwaters of Chattooga River). But, remarkably enough, Simpson gives it also from Clinch River, Va. Now, in the upper Tennessee region, occasional specimens of *vanuxemensis* turn up which are lighter in color of the epidermis and nacre, and, if they are also small, they would very well agree with *proprius*. But in this region, they form only an individual variation, and a very rare one.

In the Coosa drainage, specimens with lighter color of epidermis and nacre prevail, as is shown by the rich material from this region before me. But they are by no means smaller than the normal *vanuxemensis*. There are specimens fully as large as the general run of *vanuxemensis* in the upper Tennessee, although, exactly as in the latter, they seem to remain uniformly smaller in certain creeks. On the other hand, with regard to the color of the epidermis and nacre, there are, in the Coosa drainage, specimens fully as dark as the normal *vanuxemensis*, but such specimens are rare, and, if found, are mostly associated with lighter ones. From many places, only the light form is at hand. As a rule, old and worn specimens are the ones which incline toward the darker tints. Thus we have the following conditions: in the Tennessee-drainage, there is a dark form, the typical *vanuxemensis*, which rarely shows an inclination to become lighter; in the Coosa drainage, there is a light form, which sometimes shows an inclination to become darker. The light shells from the Tennessee cannot be distinguished from the normal Coosa-form; and the dark shells of the latter cannot be told apart from the normal Tennessee-form. These are exactly the conditions which are required for the separation of these forms as varieties of *one* species.

The normal form of the Coosa has been called *U. proprius* Lea (1865). However, also *umbrans*, *tenebricus*, and *fabaceus* belong to this stock, the oldest name being *umbrans* Lea (1857) (has only page precedence over *tenebricus*). Unfortunately, this name, founded upon two females only, stands for the dark phase of the Coosa-form, and the same is true also for *tenebricus* and *fabaceus*. But they cannot be separated upon this ground from the lighter form (*proprius*); they are simply individual variations of it.

I have two males from Othcalooga Creek, which are topotypes of *umbrans*, and they have the epidermis olive-brown near the beaks, but lighter (light brown) upon the sides. In the larger, the nacre has that beautiful, characteristic salmon tint of the Coosa-form; the smaller is pale salmon inside, whitish on the margin. Already Lea says, that there is a "disposition to yellowness" on the sides. Thus I have no doubt that he had only two unusually dark specimens before him.

The name of the Coosa-form should be: *Micromya vanuxemensis umbrans* (Lea) (1857), with the synonyms: *U. tenebricus* Lea (1857); *U. falaceus* (1861); *U. proprius* Lea (1865).

I have investigated the anatomy of the following material.

Conasauga River, Conasauga, Polk Co., Tenn.—1 barren, 2 gravid females (with glochidia), A. E. Ortmann coll., May 24, 1915,

Shoal Creek, St. Clair Co., Ala.—1 male, 2 gravid females (with glochidia), H. H. Smith coll., Oct., 1914.

Morgan Creek, Shelby Co., Ala.—5 males, 2 barren females, H. H. Smith coll., July 3, 1914.

The structure of the soft parts is absolutely identical with that of the typical *vanuxemensis* (see: Ann. Carn. Mus. 8, 1912, p. 342; NAUT. 1915, p. 65; 34, 1921, p. 91). Also here the glochidia vary a little in size: L. 0.21 to 0.23, H. 0.27 to 0.30 mm.

Attention should again be directed to the geographical distribution. This species is found, first, in the Cumberland-Tennessee drainages; then there is an Alabama-form closely allied to it, so that it can be separated only as a variety, indicating that it must have reached the Coosa-drainage by crossing over

from the Tennessee. The complete absence of this type of shell from the Mississippi valley, the coastal plain, and the lower parts of the Alabama-system, renders the idea impossible that it might have come from those parts, migrating from West to East.

9. Micromya lienosa concestator (Lea) (1857).

See: Simpson, 1914, p. 100 and 102.

Simpson admits the close affnity of *concestator* to *lienosa*, and says that *lienosa* differs in being larger and solider, in being darker and not quite so shining. It is said to be found from the Mississippi and lower Ohio drainage to southwestern Georgia, with the type-locality in southern Alabama, while *concestator* is said to be distributed from North Carolina to Louisiana, and possibly Texas. *M. lienosa* thus would be more western and northern, *M. concestator* more southern and eastern, the two forms overlapping in the Gulf drainage.

Examining my material, which comes from nearly the whole range of these two forms (Ga., Ala., Miss., La., Ark., Ky., and Ind.) I am able to verify these differences at least to a certain degree, but surely size and solidity do not hold good. Specimens from the West, indeed, generally are rather black in color, but I observe the same color in specimens from the Choctawhatchee drainage in southeastern Alabama and from the Chattahoochee in Georgia. Individuals with more brownish epidermis, and then often with more distinct rays, it is true, are more abundant towards the East, but in Alabama they are often associated with and grade into more blackish forms, so that no sharp line can be drawn.

These conditions make it impossible to distinguish the two forms as *species*. The best we can do is to separate them as *varieties*, and to call the more eastern, brownish form: *Micromya lienosa concestator*. But we must remember that there will be cases where it is hard to decide to which form a particular specimen may belong.

Among a number of specimens received from the Alabama Museum and labeled by Walker, it is very evident that this difficulty was encountered. Of specimens labeled *concestator*, I have soft parts from the following localities.

Choctawhatchee River, Blue Springs, Barbour Co., Ala.—2 males, H. H. Smith coll., May 11, 1915.

East Choctawhatchee River, Dale Co., Ala.—1 male, 1 gravid female (glochidia), J. A. Burke coll., Nov., 1915.

The anatomical structure of these is identical with that of *M. lienosa* as described previously (Ann. Carnegie Mus. 8, 1912, p. 340, and NAUT. 30, 1916, p. 55). Also the glochidia are of the same shape and size (see: ibid. 1912, pl. 20, f. 5).

10. LAMPSILIS CLAIBORNENSIS OBTUSA (Lea) (1840). (Synonym of L. *claibornensis*, according to Simpson, 1914, p. 70).

From the Choctawhatchee drainage I have 5 shells labeled *Lampsilis obtusa* by Walker. They fully agree with Lea's description of this form, and H. H. Smith remarks: "Simpson makes this a synonym of *claibornensis*: I should call it a good subspecies anyway".

These specimens differ from *claibornensis* in having a more delicate shell and the color of the posterior slope, which is dark brown (or dark greenish in young shells), contrasting with the yellowish of the rest, and produced by the confluence of the indistinct rays. This form might be, indeed, a local race of *claibornensis*, belonging to the Choctawhatchee and Chattahoochee Rivers, or even a species taking its place in these parts; the final decision depends, however, on the investigation of more material.

The affinity of this form to *claibornensis* is clearly shown in its anatomy. I have received the following soft parts.

Choctawhatchee River, Blue Springs, Barbour Co., Ala.—1 gravid female (with glochidia) (without the shell), H. H. Smith coll., May 11, 1915.

Pea River, 4 miles N. of Elamville, Barbour Co., Ala.—2 young males (shells and soft parts) J. A. Burke coll., Nov., 1915.

The gravid female has the anatomy agreeing with that of *L. claibornensis* (and that of *L. siliquoidea*, for that matter) (see: Ann. Carn. Mus. 8, 1912, pp. 348, 349). The "large dark papillae below the branchial opening", described by Lea (1863, p. 406) for *obtusus*, undoubtedly refers to the "flap", the projecting anterior portion of the inner edge of the mantle in front

of the branchial. The glochidia have also been described and figured by Lea (1858, p. 46, pl. 5, f. 1), and their measurements given as: L. 0.192, H. 0.256. I found them to agree with those of *claibornensis*: L. 0.21, H. 0.27 mm.

11. Lampsilis excavata (Lea) (1857).

See: Simpson, 1914, p. 41.

When I described the anatomy of this species (Ann. Carn. Mus. 8, 1912, p. 352), I did not have any females. The glochidia were known then from the description and figure given by Lea (1874, pl. 21, f. 6). I have now the following soft parts.

Forks of the Black Warrior River, Walker Co., Ala.— 1 gravid female, H. H. Smith coll., Oct. 15, 1912.

This female shows the mantle flap developed exactly as in *L. ovata* (Say) (and related forms); posteriorly, it is lamellar with almost smooth edge (only with traces of crenulations); anteriorly, it projects in the shape of a lacerated lobe. On the inside, there is a black-brown streak.

The glochidia are subovate, of the same shape as in *L. ovata*, L. 0.20 to 0.21, H. 0.24 to 0.25 mm. This differs from the dimensions given by me previously for *L. ovata* and *L. ovata ventricosa* (as: L. 0.24 to 25, H. 0.28 to 0.29). *These latter dimensions, however, are a mistake.* Subsequent measurements of my old material have shown that the figures are the same as in *L. excavata.* Also the glochidia of *L. ovata satura*, L. 0.22, H. 0.25 (Naut. 30, 1916, p. 56) agree with these. Already Surber (Bur. Fisher, doc. no. 771, 1912, p. 9) has correctly given the dimensions of the glochidia of *L. ovata ventricosa* as: 0.205 × 0.255, and of *L. satura* (ibid. no. 813, 1915, p. 6) as: 0.205 × 0.245 mm.

12. Lampsilis clarkiana (Lea) (1852).

Synonyms: *Unio clarkianus* Lea (1852); *U. spilmani* Lea (1861); *U. gerhardti* Lea (1862). (Simpson, 1914, pp. 53, 54, makes the first two synonyns, while he has the third as a separate species).

The *type-locality* of *U. clarkianus* is said to be Williamsport, Maury Co., Tenn. (on Duck River), but there is no doubt that

this is a mistake. Lea gives also: Georgia *or* Alabama, and Simpson specifies: Cahaba and Black Warrior Rivers, Ala.

U. spillmani is from "Luxpalila Creek" (=Lookapallila or Floating Turtle Creek), near Columbus, Lowndes Co., Miss. (Tombigbee drainage), and *U. gerhardti* is given from "Chattanooga, Ga.", which probably means Chattooga River, Ga. (trib. to Coosa). In addition, Simpson gives for this: Shorter, Macon Co., Ala. (Tallapoosa drainage). Thus these forms seem to be widely distributed over the Tombigbee-Alabama system.

All these forms resemble each other in general shape, and differ only in color of epidermis and nacre. Simpson has already united the first two; but I have no doubt that also *gerhardti* is the same shell. This differs only by the generally lighter, yellowish, color of the epidermis, with poorly developed rays, while the others are yellowish, brownish or blackish, with or without rays. A specimen collected by myself in Chattooga River is to be regarded as a *topotype* of *gerhardti*, and closely resembles this form. But I cannot sharply distinguish it from others before me, which resemble the darker *clarkianus*-type, because there are all transitions.

This species is analogous to *L. ovata ventricosa* (Barnes) of the interior basin. The color of the epidermis varies a good deal, from yellowish (chiefly in younger shells) to brownish. sometimes quite dark brown. Rays may be absent or present, narrower or wider. The nacre is whitish, often tinted salmon in the cavity. It is a rather compressed shell, and resembles, in shape, the male of *L. ovata ventricosa*, but is slightly more elongated. The greatest difference from the latter, however, is found in the postbasal expansion of the female, which, in *clarkiana*, is much less developed, and situated more anteriorly, so that the female shell is not subtruncated posteriorly, but produced into a point. The male and female shells are comparatively little differentiated, so that it is hard to tell them apart; there is a gentle projection in the postbasal region of the female, but this does not reach, by any means, the proportions seen in *ventricosa*.

I have the following material:

Conasauga River, Conasauga, Polk Co., Tenn.—1 female, with soft parts, coll. by myself, May 24, 1915.

Chattooga River, Trion, Chattooga Co., Ga.—1 gravid female (with eggs), coll. by myself, May 19, 1915.

Beaver Creek, St. Clair Co., Ala.—1 specimen, probably male, H. H. Smith coll. (identified by Walker as *clarkiana*).

Coosa River, Coosa Valley, St. Clair Co., Ala.—1 spec., young, H. H. Smith coll. (identified by Walker as *clarkiana*).

Choccolocco Creek, Jackson Shoals, Talladega Co., Ala.—1 spec., young, H. H. Smith coll. (identified by Walker as *clarkiana*).

Talladega, Talladega Co., Ala.—1 spec., probably male, Hartman collection (originally labeled *spillmani*).

Sipsey River, Elrod, Tuscaloosa Co., Ala.—2 spec., probably females, H. H. Smith coll. (labeled by Walker *clarkiana*).

Buttahatchee River, Hamilton, Marion Co., Ala.—7 spec., at least 2 females among them, H. H. Smith coll. (labeled by Walker *clarkiana*).

It should be noted that all specimens from the Tombigbee drainage have more brownish epidermis (lighter or darker), while yellowish epidermis prevails in shells from the Coosa system, yet a few of the latter are also brownish.

Of the two females I collected with soft parts, the one taken on May 19 in Chattooga River has eggs, but not glochidia. This would indicate the beginning of the breeding season in the spring, and is *entirely abnormal.* But it is known that also in other cases the breeding season becomes irregular in the southern states.

The anatomy agrees with that of *L. ovata ventricosa*, *excavata*, and related forms. The mantle flap is similar to that of these forms, with a free lobe anteriorly, not very distinct in my specimens, since it is contracted by the action of the alcohol, but several large teeth or lacerations are seen. The edge of the posterior part of the flap is nearly smooth, with a few indistinct crenulations. Also the color on the inside is normal: brownish, with a black longitudinal streak, but, on account of the contracted condition, I cannot recognize that peculiar eye-spot. There is no question that this species belongs in the *ovata*-group of *Lampsilis.*